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EXAMINER

SCHAFFER, JONATHAN C

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2621

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/064,435	Applicant(s) SARKAR ET AL.	
	Examiner Jonathan C. Schaffer	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 July 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/12/02</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 25-31 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 25-31 are drawn to functional descriptive material NOT claimed as residing on a computer readable medium. MPEP 2106.IV.B.1(a) (Functional Descriptive Material) states:

"Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer."

"Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized."

Claims 25-31, while defining a "machine-readable medium", does not define a "computer-readable-medium" and is thus non-statutory for that reason. A "machine-readable medium" can range from paper on which the program is written, to a program simply contemplated and memorized by a person. Amending the claim to embody the program on "computer-readable-medium" in order to make the claim statutory is suggested.

"In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory."

– MPEP 2106.IV.B.1(a)

Claim Rejections - 35 USC § 102

Art Unit: 2621

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4-10, 12-17, and 19-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Bokser (U.S. Patent Number 4,773,099).

1. A method for automatic triage of a text passage outputted by an optical character recognition system, the OCR-output text passage having at least one OCR-output character, the method comprising:

determining at least one OCR-output character attribute for each OCR-output character;

Bokser discloses a method using an optical character recognition database to classify the unknown characters received (col. 4, l. 20-22) it is then analyzed by the feature extraction module (Fig. 1) and the resulting features or attributes are quantified into vector format.

determining an error rate for the OCR-output text passage using a triage model and the determined at least one OCR-output character attribute;

Bokser's method, which can be used to classify singular characters or whole documents, calculates errors based on one or a plurality of test reference vectors and then assorts them according to quality, which is the definition of triage (Fig. 10B)

and comparing the determined error rate for the OCR-output text passage with an OCR-output text passage threshold error rate to perform an OCR-output text passage triage decision.

Bokser's method then computes the standard deviation of the error values and sets a threshold or "confidence bound" (Fig. 10B). Thereafter comparing every character attribute calculated error with this threshold to determine if it in fact is identified or not and to what degree of confidence and groups them accordingly (Fig. 3A-3E).

2. The method of claim 1, wherein determining an error rate for the OCR-output text passage comprises:

providing the at least one OCR-output character attribute to the triage model;

For each unknown character to be classified, the input to the classification module is a feature vector and geometry. The feature vector contains information defining selected features of the unknown character. Of importance, the technique of this invention operates properly regardless of how the feature vector is derived and what types of features are used to construct the feature vector (col. 24, l. 7-14).

determining a character interpretation error value for each OCR-output character based on a probability of the at least one OCR-output character attribute being erroneously interpreted by the system;

The classification module produces, for each unknown input character, a possibility set, which is a list of characters and associated confidences, which the unknown character might be (col. 23, l. 11-14).

and determining a text passage error value based on the at least one character interpretation error value determined for each OCR-output character.

Generally, the possibility set contains a single character candidate, but it is possible for this possibility set to contain no character candidates or more than one character candidate (col. 23, l. 16-19).

4. The method of claim 1, wherein determining at least one OCR-output character attribute for each OCR-output character comprises selecting the at least one OCR-output character attribute from a plurality of OCR-output character attributes.

For each unknown character to be classified, the input to the classification module is a feature vector and geometry. The feature vector contains information defining selected features of the unknown character. Of importance, the technique of this invention operates properly regardless of how the feature vector is derived and what types of features are used to construct the feature vector (col. 24, l. 7-14).

5. The method of claim 4, wherein the plurality of OCR-output character attributes includes at least one of a character class, a confidence descriptor class, a language of the text passage, a text passage publication date, a typeface in which the text passage is printed, an image-based feature of an individual character image and metadata attached to the text passage.

The geometry of the unknown character supplies the width and the height of the character, as defined by those "on" pixels forming the character, and subline information pertaining to the character (col. 24, l. 21-24).

6. The method of claim 1, wherein the text passage to be triaged includes at least one of pages, characters, words, phrases, text-lines, sentences, paragraphs, columns of text, blocks of text, text articles, multi-page documents, collections of single-page documents and collections of multi-page documents.

The classification module produces, for each unknown input character (col. 23, l. 11-12).

7. The method of claim 1, wherein the OCR-output text passage triage decision includes at least one of sending the OCR-output text passage directly to an end user without post-OCR processing, sending the OCR-output text passage through a post-OCR inspection and processing stage, and sending the original text passage image to be keyed in manually.

As can be seen in Fig. 12 it goes straight from computing the possibility set to outputting the possibility set. If the possibility set created contains more than one character candidate then, in one embodiment of this invention, the possibility set is sent on to other modules, such as a subline checker and context module, for post processing, so that only one character candidate remains in the possibility set after this post processing is complete. The possibility set created contains, in addition to a list of character candidates, a corresponding list of confidences, which can be used to flag characters, which were not recognized with certainty so that they can be examined by a word processing operator (col. 23, l. 43-54).

8. The method of claim 1, wherein the triage model is a trained off-line triage model.

In order to classify unknown input characters, first, during a preprocessing phase, a large number of reference data is collected and analyzed in order to form "ringed clusters" for each class of input data. For example, if the input data are characters, a set of ringed clusters is associated with each character class, such as all "e". These ringed clusters are formed so as to be later used during the classification of an unknown input character (col. 2, l. 15-23).

9. The method of claim 1, wherein the OCR-output text passage threshold error rate is a predetermined value.

In one embodiment of this invention, course ringed clusters are used such that all data of a given class are associated with a single course ringed cluster. Later, during the classification of unknown input data, these course ringed clusters are used to eliminate possible reference data as being the unknown input data if the unknown input data does not fall within that course ringed cluster. In another embodiment of this invention, a set of medium ringed clusters is used for each class of reference data such that all data of a given class fall within the union of the set of medium ringed clusters. By using a set of medium ringed clusters, fewer "aliens" (data other than the selected data associated with the medium ringed clusters) are contained in the ringed clusters, thereby enhancing the ability to accurately recognize unknown input characters. Another embodiment of this invention uses fine ringed clusters in which there are no known aliens contained within the union of fine ringed clusters of each given reference data class. This allows even greater accuracy in classifying unknown data input characters. Another feature of this invention, ringed clusters include "certainty spheres" which are used to identify with certainty an unknown input character if it lies within such a certainty sphere. As another feature of this

invention, ringed clusters also include "confidence spheres" which are used to identify, although not with certainty, the unknown input character, and assign a confidence value indicating the relative confidence associated with the possibility that this unknown character corresponds to the reference data class of the ringed cluster (col. 2, l. 13-56).

10. The method of claim 7, wherein sending the OCR-output text passage through the post-OCR inspection and processing stage comprises:

determining at least one text passage error probability value for each OCR-output text passage as a correction operator detects and corrects an error in the OCR-output text passage;

A possibility set containing no character candidates, also referred to as a 'nonrecognition possibility set', indicates that the input character simply has not been recognized. In one embodiment of this invention, segments corresponding to nonrecognition possibility sets are, if desired, sent on for further processing. For example, further modules can be used to split segments corresponding to two or more characters (a 'join'), to filter out noise, or to glue together pieces of a character which are currently broken apart into more than one data segment (a 'split'). If no further processing is done on a segment corresponding to a nonrecognition possibility set, then this possibility set can, if desired, be sent on for post processing to, for example, a spelling corrector module which would use contextual information to replace the nonrecognition possibility set with a possibility set containing a single character candidate. In one embodiment of this invention, the final text output corresponding to a nonrecognition possibility set is the '@' symbol so that a word processing operator can find all nonrecognized characters after the optical character recognition process is complete. If the possibility set created contains more than one character candidate then, in one embodiment of this invention, the possibility set is

sent on to other modules, such as a subline checker and context module, for post processing, so that only one character candidate remains in the possibility set after this post processing is complete. The possibility set created contains, in addition to a list of character candidates, a corresponding list of confidences, which can be used to flag characters, which were not recognized with certainty so that they can be examined by a word processing operator. The confidence values can also be used by the post processing modules described earlier to assist in choosing one of the character candidates (col. 23, l. 20-57).

and alerting the correction operator when the at least one text passage error probability value is improved so as to meet the OCR-output text passage threshold error value, wherein the text passage error probability value for each OCR-output text passage is based on a probability of the at least one OCR-output character attribute being erroneously interpreted by the system.

The first step is to initialize the 'done' flag to 'FALSE'. If, at any point during the compute possibility set operation, the done flag is set to 'TRUE', then this indicates that the unknown character has been recognized with certainty and a possibility set has been created (col. 24 & 25, l. 66-68 & 1-3).

12. A computer-implemented method for triage of a plurality of OCR-output text passages, each OCR-output text passage having at least one OCR-output character, the method comprising:

selecting a set of OCR-output character attributes from a plurality of OCR-output character attributes for each OCR-output character;

See Claim 1 first limitation.

determining an OCR-output character error value for each OCR-output character based on a probability of the set of OCR-output character attributes being erroneously interpreted by the OCR system;

See Claim 1, second limitation.

determining a text passage error value for each OCR-output text passage based on a probability of the text passage being erroneously interpreted by the OCR system as determined using at least the OCR-output character error values;

The confidence value is based on the error value as can be seen in Fig. 10B thus high confidence low error as well as the converse.

and comparing the determined text passage error value with an OCR-output text passage threshold error value to perform an OCR-output text passage triage decision.

See Claim 1 third limitation.

13. The computer-implemented method of claim 12, wherein the probability of the set of OCR-output character attributes being erroneously interpreted by the OCR system is determined based on at least the selected set of OCR-output character attributes processed using the triage model.

See Claim 2 second limitation.

14. The computer-implemented method of claim 12, wherein the plurality of OCR-output character attributes includes at least one of a character class, a confidence descriptor class, a language of the text passage, a text passage publication date, a typeface in which the text passage is printed, an image-based feature of an individual character image and metadata attached to the text passage.

See Claim 5.

15. The computer-implemented method of claim 12, wherein the text passage to be triaged includes at least one of pages, characters, words, phrases, text-lines, sentences, paragraphs, columns of text, blocks of text, text articles, multi-page documents, collections of single-page documents and collections of multi-page documents.

See Claim 6.

16. The computer-implemented method of claim 12, wherein the OCR-output text passage triage decision includes at least one of sending the OCR-output text passage directly to an end user without post-OCR processing, sending the OCR-output text passage through a post-OCR inspection and processing stage, and sending the original text passage image to be keyed in manually.

See Claim 7.

17. The computer-implemented method of claim 16, wherein sending the OCR-output text passage through a post-OCR inspection and processing stage comprises:

determining at least one text passage error probability value for each OCR-output text passage as a correction operator detects and corrects an error in the OCR-output text passage;

See Claim 10 first limitation.

and alerting the correction operator when the at least one text passage error probability value is improved so as to meet the OCR-output text passage threshold error value, wherein the text passage error probability value for each OCR-output text passage is based on a probability of the at least one OCR-output character attribute being erroneously interpreted by the system.

See Claim 10 second limitation.

19. An OCR-output text passage triage system that triages a text passage outputted by an optical character recognition system, the OCR-output text passage including at least one OCR-output character having at least one OCR-output character attribute, the system comprising:

an OCR-output text passage character accuracy determination circuit or routine that determines a character interpretation error value using a triage model;

See Claim 1, second limitation.

an OCR-output text passage accuracy determination circuit or routine that determines at least one OCR-output text passage quality metric using the determined character

interpretation error value and at least one statistical algorithm or model included in the triage model;

A quality metric as defined by the applicant is a text passage error value represented as a probability, that the entire OCR output text passage is erroneously interpreted by the OCR system, which has been shown to be another representation of the "confidence" disclosed by Bokser and is itself a statistical algorithm. See Claim 1, second limitation.

and an OCR-output text passage triage circuit or routine that performs one or more text passage triage decisions using the determined at least one OCR-output text passage quality metric and an OCR-output text passage threshold error rate value.

See above and Claim 1, third limitation.

20. The OCR-output text passage triage system of claim 19, wherein the triage model is a trained off-line triage model.

See Claim 8.

21. The OCR-output text passage triage system of claim 19, wherein the OCR-output text passage threshold error rate value is included in a text passage error threshold operating point model.

Bokser's "confidence bound" model is synonymous with the applicant's "text passage error threshold operating point model", which is used to select a threshold operating point that will, with high confidence, satisfy customer-specified quality requirements while minimizing the labor needed to process document text passages that are not triaged. As can be seen in Bokser's

disclosure the "confidence bounds" are defined (col. 2, l. 13-56) and implemented (col. 23, l. 11-57) to define with their threshold operating points satisfy customer-specified quality requirements with high confidence typically 97% to be precise (col. 23, l. 66).

22. The OCR-output text passage triage system of claim 19, wherein the at least one OCR-output character attribute includes at least one of a character class, a confidence descriptor class, a language of the text passage, a text passage publication date, a typeface in which the text passage is printed, an image-based feature of an individual character image and metadata attached to the text passage.

See Claim 5.

23. The OCR-output text passage triage system of claim 19, wherein the text passage to be triaged includes at least one of pages, characters, words, phrases, text-lines, sentences, paragraphs, columns of text, blocks of text, text articles, multi-page documents, collections of single-page documents and collections of multi-page documents.

See Claim 6.

24. The OCR-output text passage triage system of claim 19, wherein the OCR-output text passage triage decision includes at least one of sending the OCR-output text passage directly to an end user without post-OCR rekeying or correction, sending the OCR-output text passage through a post-OCR inspection and correction stage, and sending the original text passage image to be completely keyed in manually.

See Claim 7.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3, 11, and 18 rejected under 35 U.S.C. 103(a) as being unpatentable over Bokser (U.S. Patent Number 4,773,099).

3. The method of claim 2, further comprising:

determining a number representing a sum of OCR-output characters in the OCR-output text passage;

Since Bokser's possibility set is provided for each unknown character (col. 23, l. 11-12) and the applicant defines the text passage as being at least one character the sum is one.

and dividing the text passage error value by the number representing the sum of OCR-output characters.

Dividing the confidences by the sum being one in this case would render the confidences unchanged.

11. The method of claim 10, wherein determining the text passage error probability value for an OCR-output text passage comprises:

determining OCR-output text passage error probability values for a plurality of selected portions of the OCR-output text passage;

Bokser discloses a method that for each of the plurality of characters classified a possibility set which is a list of characters and associated confidences, which the unknown characters might be, are listed (col. 23, l. 12-14).

and arranging the plurality of selected portions of the OCR-output text passage based on the determined OCR-output text passage error probability values such that the selected portions having the highest OCR-output text passage error probability values are displayed first to the correction operator.

Though Bokser does not specifically disclose in what order the confidences are displayed it would be a design choice to display them in order of highest error or lowest confidence to lowest error or highest confidence.

18. The computer-implemented method of claim 12, wherein determining a text passage error probability value for an OCR-output text passage comprises:

determining OCR-output text passage error probability values for a plurality of selected portions of the OCR-output text passage;

Bokser discloses a method that for each of the plurality of characters classified a possibility set which is a list of characters and associated confidences, which the unknown characters might be, are listed (col. 23, l. 12-14).

and arranging the plurality of selected portions of the OCR-output text passage based on the determined OCR-output text passage error probability values such that the selected portions having the highest OCR-output text passage error probability values are displayed first to the correction operator.

Though Bokser does not specifically disclose in what order the confidences are displayed it would be a design choice to display them in order of highest error or lowest confidence to lowest error or highest confidence.

Conclusion

The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure. Hull et al. (U.S. Patent Number 5,465,653) discloses an image matching and retrieval system, which uses calculated errors in order to match images. Bares (U.S. Patent Number 5,057,936) discloses a copy quality monitoring system that uses background, foreground error calculations to determine the quality of the copies as compared to the originals.

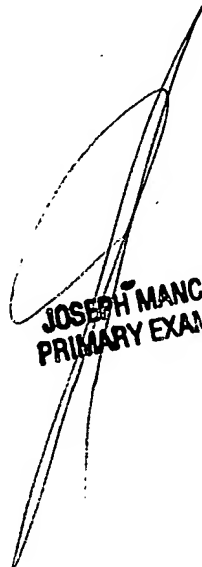
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan C. Schaffer whose telephone number is (571) 272-0603. The examiner can normally be reached on 7:30am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (571) 272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2621

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JS


JOSEPH MANCUSO
PRIMARY EXAMINER